

LAKE PEND OREILLE FISHERY RECOVERY

9404700

SHORT DESCRIPTION:

Seeks methods to recover warm and coldwater fish stocks in Lake Pend Oreille. Tests the value of a higher winter lake elevation. Develop resident fish loss assessments that demonstrate which losses are attributable to dam operation.

SPONSOR/CONTRACTOR: IDFG

Idaho Department of Fish and Game

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SUB-CONTRACTORS:

University of Idaho

GOALS

GENERAL:

Supports a healthy Columbia basin, Maintains biological diversity, Maintains genetic integrity, Increases run sizes or populations, Provides needed habitat protection, Adaptive management (research or M&E)

RESIDENT FISH:

Research, M&E

NPPC PROGRAM MEASURE:

10.6E; 10.6E.1-4; 5.4D.7

RELATION TO MEASURE:

Program measure changes the winter elevation of Lake Pend Oreille for 3 years. It also instructs IDFG to study kokanee, mysis shrimp, predators, Eurasian water milfoil and lake energy budgets. This project addresses each item specified by the Council.

TARGET STOCK

Warm water fish

Kamloops rainbow trout

Bull trout

Kokanee

LIFE STAGE

All

All

All

All

MGMT CODE (see below)

N

N

N

N,

AFFECTED STOCK

Anadromous fish

Bald eagles

Waterfowl

BENEFIT OR DETRIMENT

Beneficial

Beneficial

Beneficial

BACKGROUND

STREAM AREA AFFECTED

Stream name:

Pend Oreille River

Stream miles affected:

63

Hydro project mitigated:

Albeni Falls Dam, US Army Corps of Engineers

LAND AREA INFORMATION

Subbasin:

Upper Columbia River

Land ownership:

Public

Acres affected:

100,000

Habitat types:

90,000 acres of deep natural lake habitat and 23 miles of large river habitat.

HISTORY:

Research on Lake Pend Oreille kokanee began in 1952 when Albeni Falls Dam was built. Forty years of work, some of which was BPA funded, point to Albeni Falls Dam operation as significantly impacting the lake's fisheries. When deeper drawdowns began in 1966, kokanee harvest declined from 1 million fish annually to 100,000 to 200,000; a reduction of 80-90%. Studies also showed that warm water fish habitat in the Pend Oreille River is nearly eliminated with the deeper drawdowns. This project passed in the Council's program in Oct. 95, but the lake was still drawn down that fall. The U.S. Army Corps of Engineers began keeping the lake higher during the winter of 1996-97. This will cause a 7 fold increase in warm water fish winter habitat, and increase kokanee spawning gravel by over 2 million square feet. The Council put together work groups in 1994 and 1995 to design this study and develop the proposal. Studies began during November 1996.

BIOLOGICAL RESULTS ACHIEVED:

Project is only 3 months old, no biological results have been achieved. However, large changes in kokanee spawning habitat have been achieved this winter. We documented hundreds of square yards of redds located on the newly inundated gravel.

PROJECT REPORTS AND PAPERS:

None

ADAPTIVE MANAGEMENT IMPLICATIONS:

This project will greatly aid our understanding of the effect of drawdown on warm and cold water fish populations in several waters. It will enable us to do a much better job of balancing the needs of fish with the dam's constraints for flood control and power production. It will also enable us to develop "biological and integrated rule curves" for Lake Pend Oreille which are based on actual empirical data. Changing the limiting factors and monitoring the populations response is by definition adaptive management of the lake. This project's findings may well constitute the best chance at averting collapse of the entire kokanee population which has continued to decline in recent years. Higher lake levels on Lake Pend Oreille will mean more water will flow downstream during the spring. This water will be available for anadromous fish flows. Since kokanee are forage for bull trout, rainbow trout, squawfish, perch, bass, and cutthroat trout, the project will enhance populations of non-target species as well.

PURPOSE AND METHODS

SPECIFIC MEASUREABLE OBJECTIVES:

1. To recovery the kokanee fishery to a harvest of 750,000 fish annually. Increase the adult population of the lake to 3.75 million kokanee.
2. Produce a seven fold increase in the abundance of warm water fish in the Pend Oreille River.
3. Prevent further declines in bull trout (as measured by 500 redds in 20 index streams).
4. Determine whether other factors could be limiting the recovery of kokanee including: low zooplankton, predation, and Mysis shrimp.
5. To prevent the establishment, and associated problems, of Eurasian watermilfoil.

CRITICAL UNCERTAINTIES:

The critical uncertainty is whether or not increasing the amount of kokanee spawning area will increase the adult kokanee population. It is clear that decreasing spawning areas in the mid-1960's caused major declines in the population; we now need to prove that the reverse is true. Also, a critical uncertainty is to determine that warm water fish in the Pend Oreille River will increase with the increase in winter habitat caused by higher lake levels. A risk of the project was that the changed lake levels could allow Eurasian watermilfoil to become established in the lake. A second risk was that a new winter lake elevation could potentially cause erosion to historic cultural sites on the shoreline. A Corps of Engineers review of these risks reported a finding of no significant impact due to changed lake levels.

BIOLOGICAL NEED:

Kokanee population in Lake Pend Oreille has declined greatly over the last three decades. Harvest has dropped from over 1 million fish to less than 100,000 fish. Predators which feed on kokanee have also declined. Twenty three miles of the Pend Oreille River contain almost no sport fishery due to loss of winter fish habitat. We hypothesis that a lower winter pool elevation has reduced the amount of available spawning gravel on the shorelines and removed winter habitat for warm water fish. We need to know if raising the winter lake level can reverse these impacts.

HYPOTHESIS TO BE TESTED:

The following are the project's alternative hypotheses. (The null hypothesis would be the same statement but predicting no change.)

- 1.1 The correlation of lake elevation to survival rate from eggs to fry will be positive and significantly different from a slope of 0.
- 1.2 Survival rates from eggs to fry will be significantly higher in years of higher winter water levels than previous years of low winter lake levels.
- 1.3 Kokanee abundance during test years of higher water levels will define a higher, more resilient, stock-recruitment curve.
- 1.4 The abundance of kokanee in each year class produced under higher lake levels will show a significant increase when compared to kokanee abundance in the last 7-14 years.
- 1.5 Estimates of fry produced at historic spawning areas will be significantly higher in years of a higher winter elevation.
- 2.1 There will be no net change in area of usable spawning gravels below the test elevation.
- 2.2 There will be no net increase in the silt content of the available spawning gravels below the test elevation.
- 3.1 Younger age classes of warm water fish will increase during years of higher winter water levels in the Pend Oreille River above Albeni Falls Dam.
- 4.1 Food is not limiting kokanee of any age class at this time.
- 4.2 Timing of thermal stratification of the lake will not limit fry survival.
- 4.3 Predation is not a limiting factor for the kokanee population.
- 4.4 Mysis shrimp consumption of zooplankton is not sufficient to reduce kokanee fry abundance.
- 5.1 Eurasian milfoil will not become established in Lake Pend Oreille during the course of this study.

ALTERNATIVE APPROACHES:

One alternative approach was to build artificial spawning beds around the lake. After very lengthy discussions this approach was rejected because spawning beds would need to be massive in size, cleaned annually, and their construction would cause additional impacts to the lake.

JUSTIFICATION FOR PLANNING:

na

METHODS:

Experimental design is to change lake elevations and monitor the survival and abundance of kokanee and warm water fish. Kokanee abundance has been estimated annually for each year class of fish since 1977. Warm water fish abundance was estimated in 1991 and 1992. These will be the data bases for comparison. Kokanee abundance will be estimated by a stratified random survey, annual, using a mid-water trawl. Trawl sample size is 36 hauls which experience has shown give population estimates with 90% confidence limits of +/- 25%. Split-beam hydroacoustics will also be used for abundance estimates. Beach seining and gillnetting will be used for warmwater fish surveys. Parametric statistics will be used to compare kokanee of different year classes. Bioenergetics will be used to model Mysis-zooplankton-kokanee-predator interactions.

PLANNED ACTIVITIES

SCHEDULE:

Planning Phase **Start** 1/94 **End** 11/95 **Subcontractor** no

Task Northwest Power Planning Council set up a workgroup to develop and review the project design.

Implementation Phase **Start** 4/97 **End** 9/2001 **Subcontractor** Univ. of Idaho

Task The first implementation phase will be to annually monitor the kokanee population and determine the response to lake level changes. Hydroacoustic surveys and mid-water trawling will be conducted. Near shore spawning areas will be monitored for erosion and siltation. Food chain will be modeled to determine roles of Mysis shrimp, predators, zooplankton and kokanee. Changes in warm water fish abundance will be examined in the Pend Oreille River. Aquatic vegetation studies will be conducted to monitor Eurasian milfoil and develop management plans to avoid potential problems.

CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:

This project is dependent on the Army Corps of Engineers changing the lake level each fall.

OUTCOMES, MONITORING AND EVALUATION

SUMMARY OF EXPECTED OUTCOMES

Expected performance of target population or quality change in land area affected:

The expected outcome is that we will find that higher winter lake levels allow the kokanee population and warm water fish populations to expand by at least 50% (a statistically significant change). This would demonstrate that water level management is critical to these populations.

Present utilization and conservation potential of target population or area:

Currently, 100,000 to 200,000 kokanee are harvested annually. Very few warm water fish are harvested in the Pend Oreille River above Albeni Falls Dam.

Assumed historic status of utilization and conservation potential:

Our earliest creel surveys in the 1950's and 1960's show an average of 1 million kokanee were harvested annually from the lake. The Pend Oreille River supported good catches of cutthroat trout.

Long term expected utilization and conservation potential for target population or habitat:

Our goal for the lake is to achieve an adult population of 3.75 million kokanee which will be capable of supporting an annual harvest of 750,000 fish. The improvement in kokanee abundance will allow for an expansion in the population of bull trout, and Kamloops rainbow trout. The expansion of warm water fish will allow the Pend Oreille to become a productive fishery where currently almost 26 miles of river go unfished. Outcome will also include the development of integrated rule curves which will aid the long term management of the lake. The increase in spring-time flows will hopefully be utilized to the benefit of anadromous fish.

Contribution toward long-term goal:

The project will contribute the information we need to recover fish stocks that were impacted by dam operation.

Indirect biological or environmental changes:

By keeping the lake higher in the winter, it will have less storage capacity to catch spring run off. Thus, additional water will be passed each spring which could hopefully help anadromous fish flows.

Physical products:

Project raises the lake level 4 feet during winter, this creates 2 million additional square feet of spawning area for kokanee. It also creates numerous winter refugia for warm water fish in the Pend Oreille River.

Environmental attributes affected by the project:

Kokanee spawning areas increase in size. Mud flats around the lake are reduced. More water passes downstream during spring run-off. Higher winter pool levels allow more docks and marinas to function during the winter. Aquatic macrophyte beds around the lake will double in size.

Changes assumed or expected for affected environmental attributes:

With the above habitat changes we would expect to see: an increase in kokanee fry, more warm water fish, more eagles using the lake during winter, and more waterfowl using the lake each fall.

Assessment of effects on project outcomes of critical uncertainty:

One critical uncertainty was whether increased numbers of kokanee fry would translate into increased numbers of adult kokanee. To assess this, the project will run for 5 years and follow year classes of kokanee as they grow up. A second uncertainty was whether or not more warm water fish habitat would produce an increased population of warm water fish. During the second and third years of study, we will conduct netting in the river and compare our catch to previous samples.

Information products:

The project will provide information on the role of lake levels in providing spawning areas, predator-prey dynamics, mysis shrimp competition, and shoreline siltation.

Coordination outcomes:

Project will be coordinated with BPA, Corps of Engineers, and Northwest Power Planning Council.

MONITORING APPROACH

Biological outcomes could be monitored by watching kokanee survival rates (particularly egg to fry survival) as well as the absolute number of kokanee in year classes produced under the higher water levels. Also, the catch per unit effort of warm water fish will also be an indication of the biological outcome of the project.

Provisions to monitor population status or habitat quality:

We have two large trawlers, a hydroacoustic boat, and crews that know how to use this gear.

Data analysis and evaluation:

Population data will be statistically analyzed. Trawling is done using a stratified random design and 90% confidence limits are placed around the mean. We will record the presents or absence of Eurasian milfoil. Zooplankton, predator abundance, mysis shrimp feeding will be incorporated into models.

Information feed back to management decisions:

The State's Regional Fishery Manager is deeply involved in this project. The biggest decision will come in the last year of the project when long term lake management plans need to be decided on. At that point a management plan will be written and submitted to the Council and Corps for review.

Critical uncertainties affecting project's outcomes:

Conducting the project as designed will resolve these uncertainties.

EVALUATION

Elements indicative of project success: better survival rates on kokanee, higher kokanee abundance, development of a management plan to avoid milfoil problems, the determination of whether or not competition or predation are problems for kokanee, and the determination of whether or not spawning areas are stable.

Incorporating new information regarding uncertainties:

This project is reviewed annually. Changes could be incorporated into subsequent work plans.

Increasing public awareness of F&W activities:

Project continues to have good public involvement. News releases, interviews, articles etc. are all geared at letting the public know this is an effort to enhance their fish and wildlife.

RELATIONSHIPS**RELATED BPA PROJECT****RELATIONSHIP**

none

OPPORTUNITIES FOR COOPERATION:

Project is relying on cooperation from the US Corps of Engineers. They are responsible for changing lake levels each winter as specified in the Council's program. Equipment, and temporary labor, is shared between this project and the Dworshak Fishery Research Project , 8709900.

COSTS AND FTE

1997 Planned: \$315,480

FUTURE FUNDING NEEDS:

<u>FY</u>	<u>\$ NEED</u>	<u>% PLAN</u>	<u>% IMPLEMENT</u>	<u>% O AND M</u>
1998	\$360,000	5%	95%	
1999	\$370,000	5%	95%	
2000	\$370,000	5%		95%
2001	\$370,000			100%

PAST OBLIGATIONS (incl. 1997 if done):

<u>FY</u>	<u>OBLIGATED</u>
1997	\$315,480
TOTAL:	\$315,480

Note: Data are past obligations, or amounts committed by year, not amounts billed. Does not include data for related projects.

LONGER TERM COSTS: na

1997 OVERHEAD PERCENT: 24.6%

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:

Only applies to the sum of personnel and Operating money. Does not apply to Capitol Outlay purchases.

CONTRACTOR FTE: 2

SUBCONTRACTOR FTE: 4

SUPPLEMENTAL RESIDENT FISH EVALUATION FACTORS:

This project develops a biological rule curve for Lake Pend Oreille and in fact is testing the response of fish populations to it. This is a project which changes the winter habitat of the lake and will likely change the abundance of the main forage species. The project therefore affects every species in Lake Pend Oreille including eagles and waterfowl. Biological objectives of this project have been adopted into the State of Idaho's 5 year plan.